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ORGANIC MATERIALS AND THEIR APPLICATIONS IN OLEDS AND SOLAR CELLS

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Abstract. Materials showing white light emission have found applications in variety of solid state devices especially in display technology. For white light emission, doping of red (R), green (G) and blue (B) emitters in host matrix is commonly practiced. However, finding the RGB emitters of similar stability with their homogenous doping is challenging. Furthermore, such devices suffer from color purity in long run. Small organic light emitters, capable of colour tuning and having broad emission spectrum are in high demand as they provide colour stability, reproducibility, simple device geometry and high efficiency. Recently, it has been shown that efficiency of OLEDs can be enhanced by employing the thermally activated delayed fluorescence (TADF) materials. Donor-acceptor-donor (D-A-D) materials having acridone as acceptor unit and carbazole as donor were synthesized for opto-electronic applications. Steady state and time dependent emission studied provided insight on their possible thermally activated delayed fluorescence (TADF) behavior. The singlet-triplet energy gap (ΔE_{ST}) was found to be as low. These materials were found to be efficient green TADF emitters in organic light emitting diode (OLED) devices. Furthermore, an exciplex emission at 465 nm was observed in the blends of these D-A-D with polyvinylcarbazole (PVK). OLEDs fabricated with blend showed electroluminescence which is matching well with the exciplex photoluminescence. Apart from D-A-D in OLEDs, application of new class of high dipole moment materials in solar cell will also be discussed.